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FINAL REPORT

TITLE: BUILDING 028 AND STIR FACILITY DECONTAMINATION AND DECOMMISSIONING

- APPROVALS -

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TABLES

FIGURES

1. INTRODUCTION AND BACKGROUND

1.1 LOCATION

Building T028 is located within Rockwell International's Santa Susana Field Laboratory (SSFL) in the Simi Hills of southeastern Ventura County, California, adjacent to the Los Angeles County Line and approximately 29 miles northwest of downtown Los Angeles. Location of the SSFL relative to Los Angeles and vicinity is shown in Figure 1-1. An enlarged map of neighboring SSFL communities is shown in Figure 1-2. Figure 1-3 is a SSFL layout showing location of Building T028. A drawing (plan view) of Building T028, as it existed prior to above-grade demolition, is shown in Figure 1-4.

Figure 1-5 shows the above grade portion of Building T028 after demolition. Using USGS terminology, the description for Building T028 is: Section 25 of Township T2N: Range R18W: Calabasas Quadrangle.

1.2 AREA CHARACTERISTICS

Figure 1-6 shows the remaining below-grade structure, consisting of the original test vault area.

The terrain throughout most of the SSFL areas is uneven due to rock outcroppings. Rock outcroppings are prevalent east upslope from the facility to the north, and to the south and west. Water runoff is primarily to the west at the western end of the facility. Surrounding the facility in all directions is asphalt paving. The minimum distance to the SSFL boundary is approximately 300 ft. This boundary lies in a northeasterly direction (Simi Valley direction). Grade floor elevation is approximately 1,800 ft above sea level.

1.3 OPERATING HISTORY

Building T028 was originally constructed to perform tests of space reactor shields using a fission plate driven by neutrons from the thermal column of a 50-kW swimming pool-type reactor. This reactor was designated the Shield Test Reactor (STR) and operated from 1961 to 1964, when it was replaced with another reactor design to operate at 1 MW. This latter configuration was named the Shield Test and Irradiation Reactor (STIR) and operated through 1972. Following shutdown of the test program and removal of the reactor, the facility was decommissioned and made available for alternate use in March 1976 (Ref. 1).

In 1977, operations were started to investigate the behavior of molten UO_2, relative to simulated reactor accidents, in particular, its reaction with floor and structural materials. These experiments resulted in some recontamination of various parts of the building that were used for the preparation and the melting of the UO_2. Tests continued intermittently into 1981. Some facility modifications were made after that, and a decision to terminate operations was made later

in 1981. The building remained inactive, under periodic surveillance, until 1988 when cleanout and decontamination began.

In April 1989, it was determined that there was no remaining radioactive contamination in the above-grade portion of the building and that part of the structure was demolished. Only the concrete floor and the below-grade test vault and stairway currently remain.

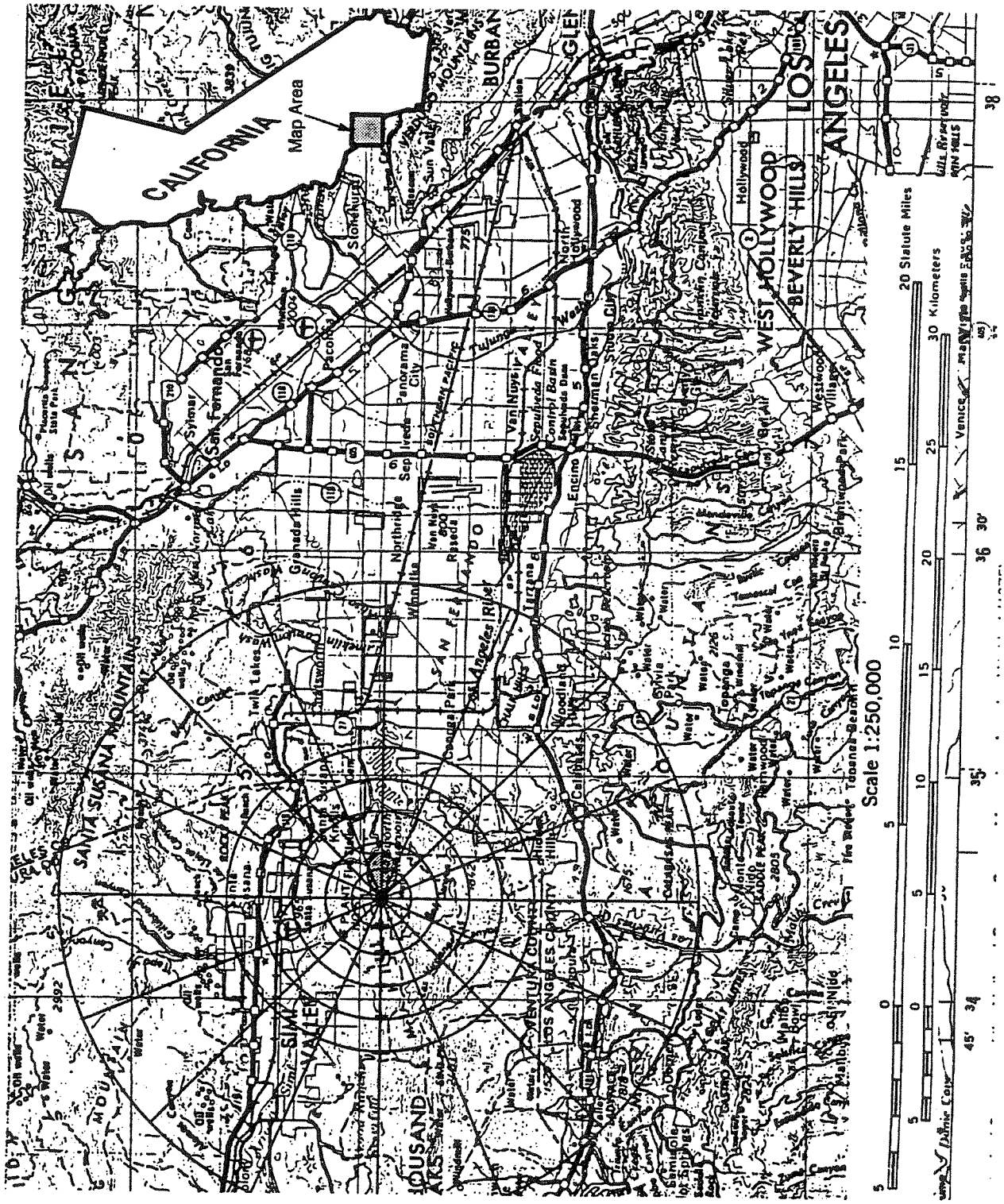

Figure 1-1. Map of Los Angeles Area

Figure 1-2. Map of Neighboring SSFL Communities

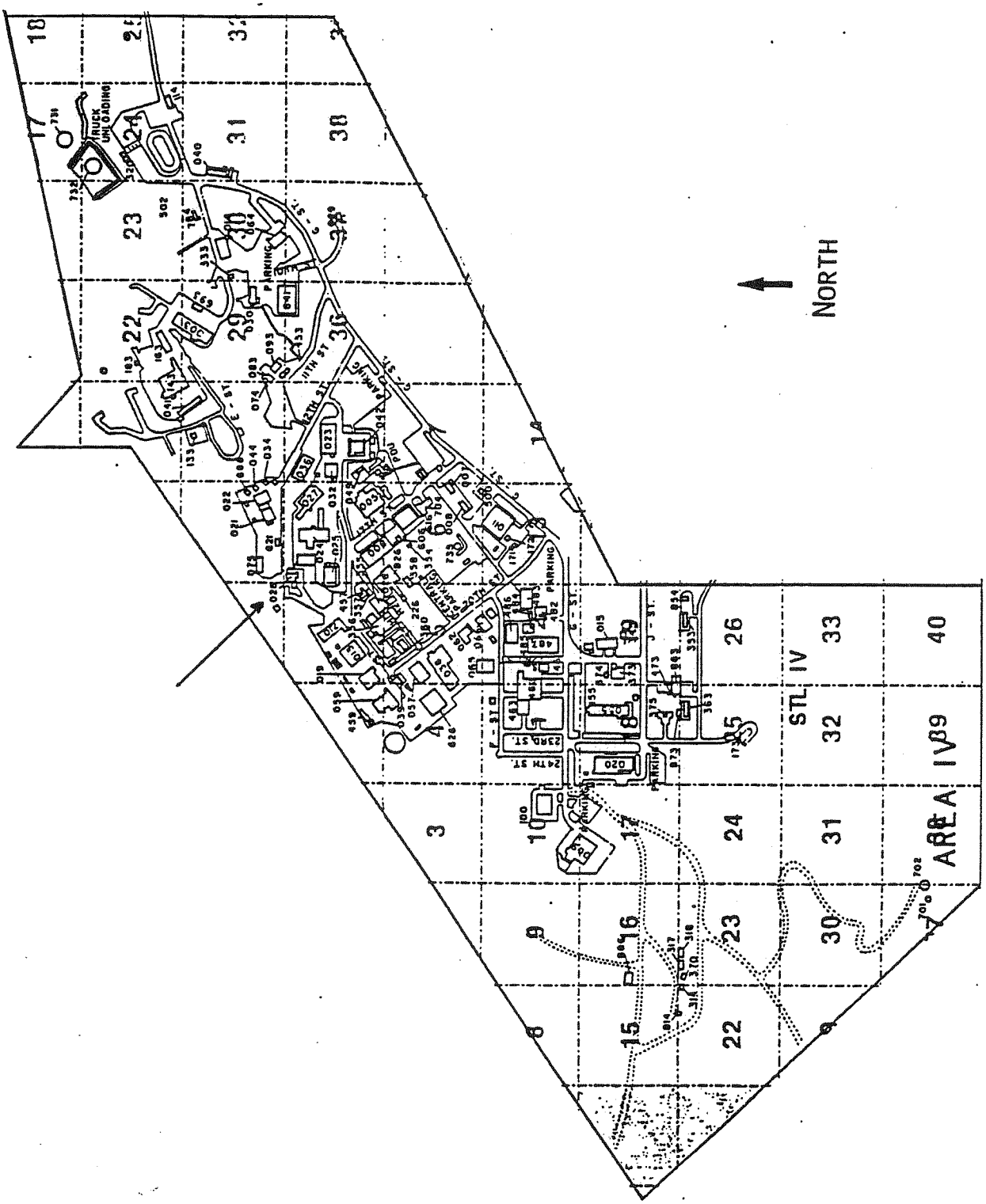

Figure 1-3. SSFL Layout Showing Location of Building T028

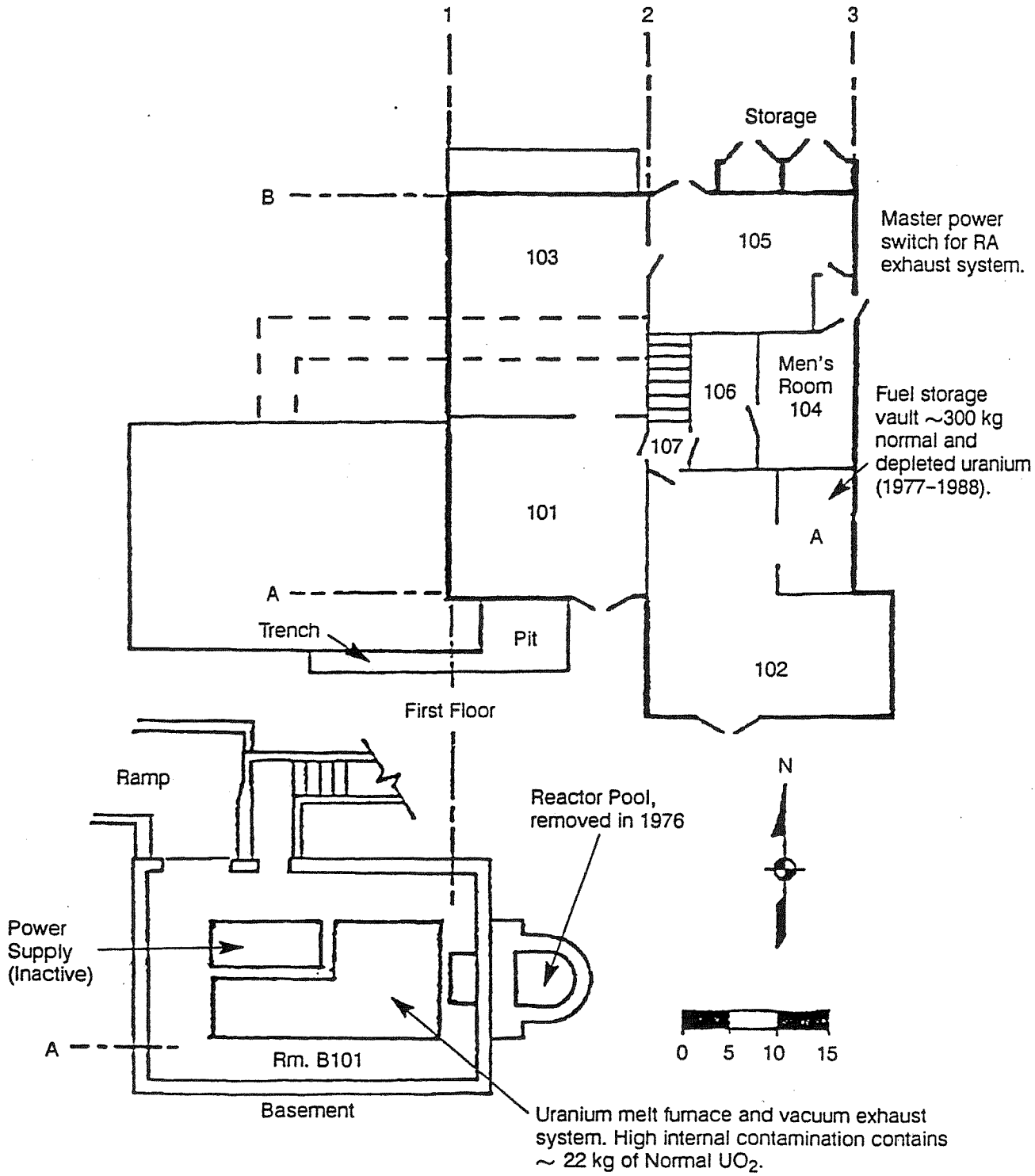

Figure 1-4. Plan View of Building T028 Prior to Decontamination and Above-Grade Demolition (1977-1988)

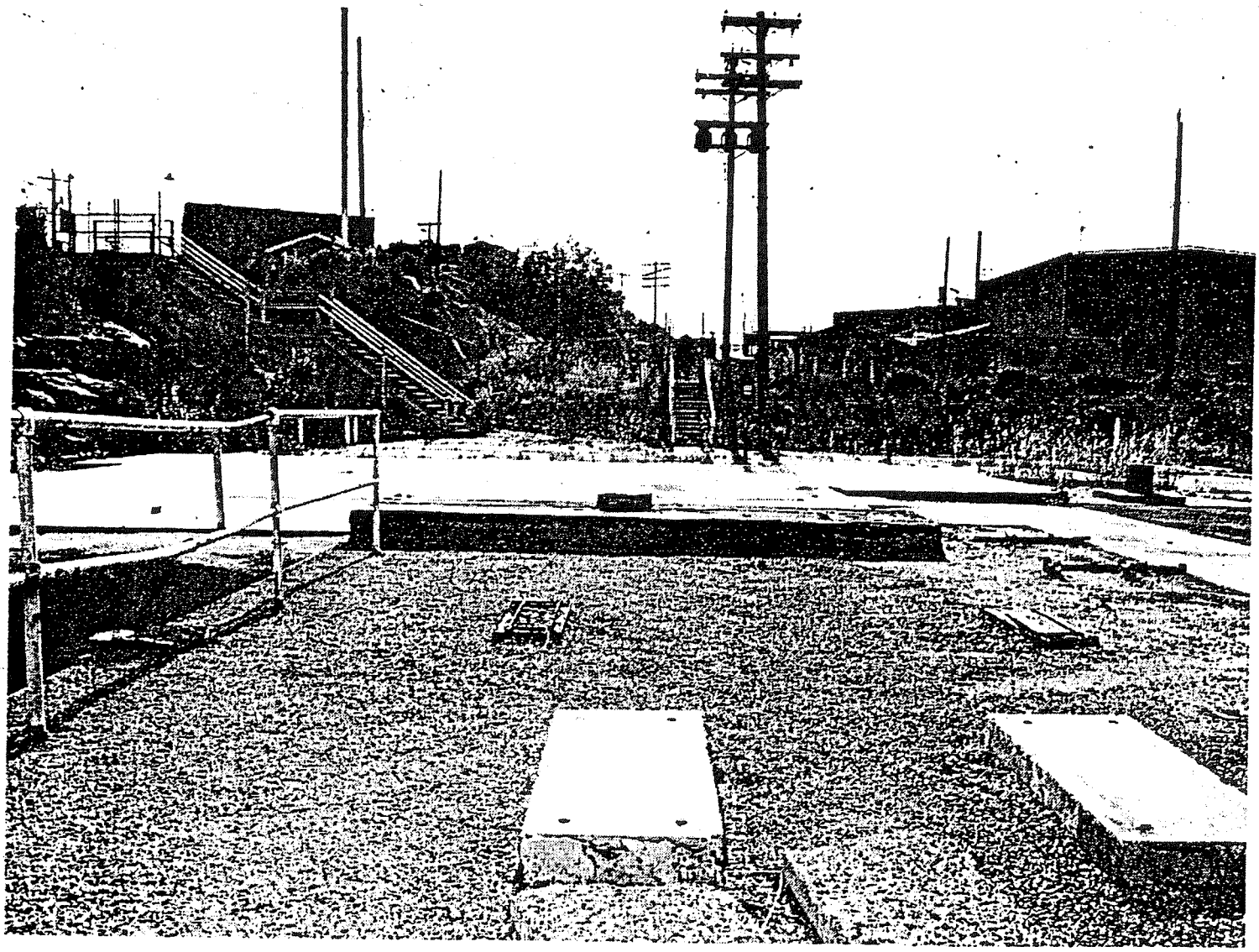

Figure 1-5. Above-Grade Portion of Building T028 After Demolition

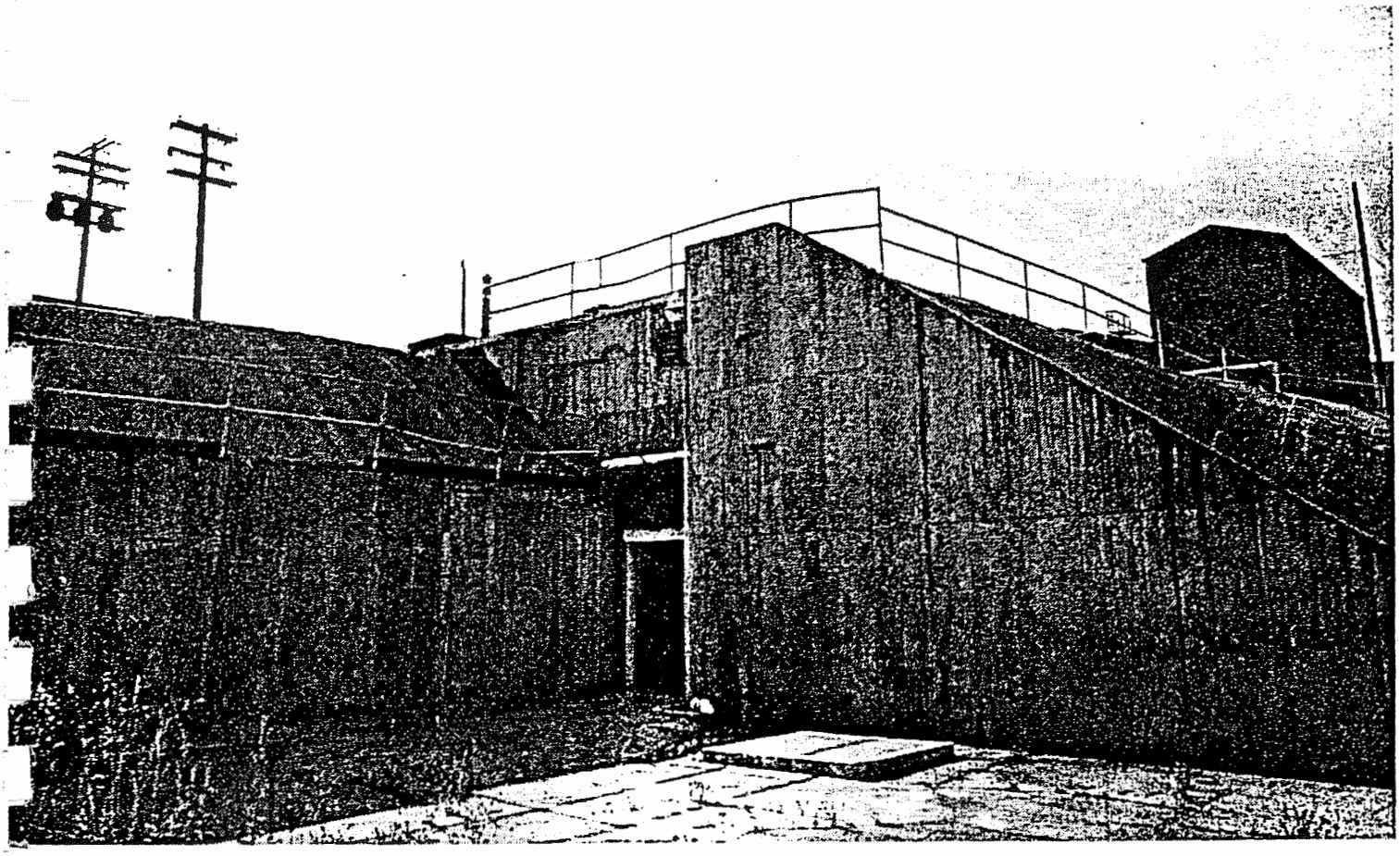

Figure 1-6. Existing Below-Grade Portion of Building T028

2. PRIOR DECONTAMINATION EFFORTS

The Shield Test Irradiation Reactor (STIR) facility was declared excess, and the dismantling proceeded as described in the "Decontamination and Disposition (D&D) of Facilities Program Plan," PP-704-990-002 (Ref. 8). The dismantling of STIR was estimated to begin on October 1, 1975 and be completed on October 1, 1976 (12-month time frame). The actual dismantling of STIR began on September 24, 1975 and was completed March 26, 1976. The fuel elements were removed, and the pool water was drained in June 1973. Contaminated and irradiated components and structures associated with the reactor, water cooling system, thermal column, test carriage, and facility exhaust system were removed, packaged, and shipped to Beatty, Nevada for disposal by land burial. Nonradioactive peripheral equipment such as the cooling tower, shield door, and film conveyor were removed as salvage. Floor and wall openings resulting from the D&D operations were filled and covered with concrete. This was required to restore the facility to a safe condition.

3. SUMMARY

3.1 STIR FACILITY

The decontamination and disposition (D&D) of Building 028, STIR facilities, are complete. The core tank, the activated concrete structures surrounding the core tanks, the thermal column, the reactor shield, the test vault carriage, the water cooling systems, and the water shield door were removed, and the facility exhaust system was partially dismantled. The facilities were decontaminated to levels which were as low as practicable, but in all cases to levels below the limits described as acceptable for future unrestricted use. The more significant D&D activities are summarized, and special techniques are noted in Section 4.0. Results of the radiological monitoring in support of the D&D operations and of the final radiological survey are presented in (Ref. 1)

3.2 BUILDING T028

The overall schedule for the D&D of Building T028 facility was estimated to require 6 months, excluding the demolition. The actual time required was slightly less than 5 months (July through December 1988), including disposal of an unexpected amount of oil found within the vacuum systems. The demolition required 3 months and was completed by mid July 1989.

Briefly, the D&D steps involved were (1) removal of surplus normal and depleted uranium oxide; (2) decontamination and removal of equipment and electrical components, including the furnace system used for the uranium-oxide experiments; (3) removal of the radioactive ducting system; (4) building surfaces decontamination, including scabbling of Room 101A concrete floor; (5) final miscellaneous cleanup operations; and (6) final radiological survey of the T028 building facility (above-grade and basement).

Following analysis of the final radiological survey data, which showed no residual radionuclide contamination above acceptable levels (Ref. 9), the building was released to Taylor Wrecking Co. for demolition and removal of the above-grade structures. The structure demolition and removal work was completed in July 1989.

All radioactive waste from the facility D&D was sent to the RMDF for packaging and shipment to Hanford, Washington. A total of about 1,200 ft^3 of waste was shipped to Hanford.

At the request of the U.S. Department of Energy (DOE), the Environmental Survey and Site Assessment Program (ESSAP) of the Oak Ridge Institute for Science and Education performed a verification survey of Building T028. Activities included document reviews, surface scans, surface activity measurements, soil sampling, and sample analyses.

ESSAP's independent measurement and sampling data for Building T028 were within the generic surface contamination DOE guidelines. It is, therefore, ESSAP's opinion that these areas meet the requirements for release to unrestricted use.

4. PROJECT ACTIVITIES AND RESULTS

All of the activities discussed below were performed in accordance with approved, written procedures. The procedures employed are cited in references 4,6 and 10 and presented in Table 4-1. The details of the day-by-day activities, identification of crews, and other information are contained in the operational log book titled "Building T028 Decontamination — August 1988," which is located in the Atomics International Library as R001410. Copies of the Health and Safety Analysis Reports citing the activity levels of pallets 1, 2, 3, and 5 prior to shipment from Building T028, and electrical equipment prior to wire removal are contained in Appendix A, Ref. 10.

Table 4-1. Building T028 Decontamination, Decommissioning, and Demolition Procedures

1.	173DWP000010, Structural Surfaces Decontamination, Rev New. Revised 8/11/88 for use at T028.
2.	173DWP000019, Known and Suspect Contaminated Support Areas Decontamination, Rev New. Revised 8/11/88 for use at T028.
3.	N001OP160007, Decontamination and Size Reduction of Low Level R/A Materials, Rev New. Approved for use 8/11/88.
4.	4173DWP000020, radioactive Waste Handling Procedure, Rev New. Revised for use at Building T028, and approved 8/11/88.
5.	N704DWP990082, High Volume Exhaust Removal, Rev A. Revised for use at Building T028 and approved 8/11/88.
6.	N001DWP000019, Size Reduction and Removal of Vacuum Furnace System, Rev New. Approved for use 8/3/88.
7.	173DWP000021, Bldg T028 Radiological Survey Procedure, Rev New. Revised for use at T028 and approved 8/11/88.
8.	094QAP-00, Inspection Requirements for the Shipment of Radioactive Materials, Rev E, Approved 8/11/88.
9.	089QPP000001, Radioactive Material Packaging and Shipping Quality Assurance Program Plan, Rev A, Approved 8/11/88.
10.	N704DWP990094, Solidification of TRU-Contaminated Oil, Rev New. Approved 10/4/88.

4.1 SURPLUS URANIUM OXIDE DISPOSAL

The surplus uranium oxide was assembled, packaged and palletized for disposal. The total inventory removed was 278,671 gm of normal uranium oxide and 22,405 gm of depleted uranium

oxide as detailed in Appendix D, Ref. 10. The work was performed from July 14, 1988 to August 1, 1988. This material was shipped to Hanford, Washington as radioactive waste.

4.2 EQUIPMENT DECONTAMINATION

Equipment, piping, hardware and electrical components were disconnected, disassembled and packaged for disposal. The health physicist monitored the waste continuously as it was being removed and packaged for shipment to salvage if clean, and to the Radioactive Material Disposal Facility (RMDF) if contaminated. This activity encompassed both rooms 102A and B-101. This effort was performed from August 1, 1988 to August 19, 1988.

4.3 BUILDING SURFACES DECONTAMINATION

Room 101A concrete floor was scabbled and the walls were decontaminated over the period of August 22, 1988 through August 24, 1988. Radiological release surveys showed the room to be acceptable for release.

4.4 FILTER SYSTEM DECONTAMINATION, REMOVAL AND DISPOSAL

Removal of radioactive ducting began with the attic and continued through Room 102A, the change room and the rest room during the period from August 25, 1988 through August 30, 1988. The effort was stopped while the furnace and appurtenances were examined and work started to achieve the disposal site's schedule target for furnace shipment. It was necessary to repair and have the radioactive filter system operational for the furnace cleanup and removal work. Following removal of the furnace the remaining ventilation ducting was removed. This activity was performed over the period of October 10, 1988 through October 20, 1988.

4.5 FURNACE DECONTAMINATION, REMOVAL AND SHIPMENT

Vacuum pump flushing was completed on September 1, 1988, before a 2-week hiatus was called for other site work. Decontamination, monitoring, appurtenance removal and sealing of the arc furnace was performed over the period of October 10, 1988 through October 13, 1988 during which an oily substance was found to be leaking from the filter box. Delay of the shipment of the furnace to RMDF until November 14, 1988 resulted from the resolution of this problem. A special procedure was prepared and implemented (Ref. 3). The oil was solidified with Petroset and the surfaces wiped.

During the period of October 17, 1988 through October 18, 1988, surveys were conducted, the furnace placed on a pallet and its exterior cleaned. The furnace was loaded with LSA waste and diatomaceous earth, sealed and prepared for shipment. The furnace was shipped to Hanford, Washington, for burial as radioactive waste and the equipment was struck from the property accountability rolls per Ref. 5.

4.6 MISCELLANEOUS CLEANUP

Over the period of October 31, 1988 through November 22, 1988, miscellaneous cleanup and surveys were done. The prefilter, the HEPA filter components and the stack was removed from the building exterior, the sump was pumped out and the furnace power transformer removed. The balance of cleanup, decontamination and disposal activities were conducted at the RMDF and completed by December 7, 1988.

4.7 FINAL SURVEYS

The final radioactive survey was conducted beginning November 14, 1988, and the radiological status of the facility, reported in Ref. 6, was that all portions of the above ground structure may be disposed of as conventional waste. Radiological survey overchecks were performed on demolished materials. Below-grade concrete portions met the criteria for release for unrestricted use, and remain in place. A site water runoff analysis was done on September 15, 1988, and determined that there was no detectable activity. (Ref. 10, Appendix E)

4.8 BUILDING DEMOLITION

Reference 7 is the demolition specification that was used by Taylor's Wrecking Company for the demolition of the above-ground portions of the building, under Purchase Order No. R 95NJZ89-09-6030. The work was performed over the period of April 17, 1989 through July 26, 1989.

5. WASTE

5.1 STIR FACILITY

All radioactive waste generated from the STIR D&D activities was sent to the RMDF. Contaminated water from the concrete coring and Hoe-Ram operations was evaporated at the RMDF. Solid waste was packaged in containers and shipped in three shipments to Beatty, Nevada for land burial. A total of 1,500 ft^3 of waste was shipped.

5.2 BUILDING T028

All radioactive waste resulting from the Building T028 D&D activities was sent to RMDF for packaging and shipment, and ultimately sent to Hanford, Washington, for land burial. A total of 1,183.7 ft^3 for the arc furnace, 690 ft^3 of boxed waste, and 22.2 ft^3 of material in drums.

For the types of waste generated at the STIR facility and T028 see reference Section 3.0 of this report.

Two separate waste disposal sites were used, Beatty, Nevada (1976), and Hanford, Washington (1988), as noted above.

6. PERSONNEL EXPOSURE

Monitoring of internal and external radiation exposure to personnel, as prescribed in the Operational Safety Plan, was conducted throughout the STIR dismantling operations.

Personnel were periodically evaluated, by urinalysis, for internal exposure to mixed fission products, activation products, and nonspecific gross alpha emitters. All results were at or below the appropriate minimum detection limits for the analysis performed.

The external radiation exposure of the nine persons directly associated with the dismantling operations, during the period of September 23, 1975 through January 31, 1976, when the reactor vessel internals, and reactor shielding were removed, averaged 193 mrem, with a maximum individual exposure of 420 mrem. The entire operation was performed with a total radiation exposure of 1.7 man-rem (Ref. 1).

Monitoring of internal and external radiation exposure to personnel, as prescribed in the Rocketdyne Health & Safety manual, was conducted throughout the Building T028 D&D operations.

Film badges were worn by all persons entering the radiologically posted areas. These badges, which contained beta-gamma-sensitive film packets with the appropriate shields for radiation quality assessment, were processed quarterly by an independent laboratory and provided the legally documented record of external exposure.

None of the Engineering or Radiation and Nuclear Safety personnel assigned to the T028 decommissioning activity received any measurable exposure to ionizing radiation during the decommissioning (Ref. 10).